

Questions for 銀河天文学特論 III(Ginga tenmongaku tokuron III)

Answer the following questions either in Japanese or in English. Answering four of eight questions is mandatory to get the credit. Those who could not attend more than eight times should answer at least six questions.

Submit your report either to bring the paper form to the administration office of Department of Astronomy, or to send a pdf file to doi@ioa.s.u-tokyo.ac.jp.

Due date: Aug.31(Fri), 2012

Q1. Comparisons of the survey speed for the wide-field survey.

The survey speed of wide-field imaging observations is approximately proportional to $A\Omega$, where A is the total light collecting area of the telescope, and Ω is the field of view of the imager. Show that the survey speed is roughly proportional to $A\Omega$, and also discuss what kind of conditions are assumed for this approximation.

Q2.Zero point of magnitudes

Describe how the zero point of AB magnitudes are defined. Calculate how faint a 25th magnitude star is compared with Vega.

Q3. Spectrograph

Choose two different types of spectrographs, and compare them by describing advantages and disadvantages of those spectrographs.

Q4. Big Bang paradigm

Pick up three major observational evidences for the big bang paradigm, and describe the basic principle of observations of each item.

Q5. Density of the Universe

How the energy density of the universe can be varied from the radiation dominated era? Derive density variation as a function of time in three different phases (radiation dominated, matter dominated, and vacuum dominated).

Q6. Dark Energy

Pick up two major observational evidences for the acceleration of the universe (or for dark energy), and describe the basic principle of observations of each item.

Q7. Age of the Universe

Derive the equation to estimate the age of the universe as a function of z , H_0 , Ω_M , Ω_Λ , and Ω_R . Calculate the age of the universe if $H_0=73\text{km/s/Mpc}$, $\Omega_M=0.5$, $\Omega_\Lambda=0.5$, and $\Omega_R=0$. (All Ω s here are the present values.)

Q8. Structure Formation and Dark Matter

Explain the mechanism of “Silk damping”. Discuss why “Dark Matter” is necessary for the structure formation related to Silk damping.

~~<http://www.ioa.s.u-tokyo.ac.jp/~doi/kougi/gintoku1.pdf>~~

Correction!

2, 3, ..., 11

<http://www.ioa.s.u-tokyo.ac.jp/~doi/kougi/gintoku1.pdf>